

STRUCTURE AND METHOD FOR FABRICATING SEMICONDUCTOR  
STRUCTURES AND DEVICES UTILIZING THE FORMATION OF A COMPLIANT  
SUBSTRATE FOR MATERIALS USED TO FORM THE SAME AND  
PIEZOELECTRIC STRUCTURES HAVING CONTROLLABLE OPTICAL SURFACES

5

ABSTRACT OF THE DISCLOSURE

High quality epitaxial layers of monocrystalline materials can be grown overlying monocrystalline substrates such as large silicon wafers by forming a compliant substrate for growing the monocrystalline layers. An accommodating buffer layer comprises a layer of monocrystalline oxide spaced apart from a silicon wafer by an amorphous interface layer of silicon oxide. The amorphous interface layer dissipates strain and permits the growth of a high quality monocrystalline oxide accommodating buffer layer. The accommodating buffer layer is lattice matched to both the underlying silicon wafer and the overlying monocrystalline material layer.

Any lattice mismatch between the accommodating buffer layer and the underlying silicon substrate is taken care of by the amorphous interface layer. In addition, formation of a compliant substrate may include utilizing surfactant enhanced epitaxy, epitaxial growth of single crystal silicon onto single crystal oxide, and epitaxial growth of Zintl phase materials. Further, various shaped piezoelectric structures having optical surfaces may be disposed on the overlying monocrystalline layer for optical switching and controlled manipulation of light signals.